

Second Report: Damage from Superstorm Sandy to Horseshoe Crab Breeding and Shorebird Stopover Habitat on Delaware Bay

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Summary

A team of biologists aerially surveyed the impact of Superstorm Sandy on the habitat suitability of the Delaware Bayshore for horseshoe crabs and shorebirds. We found a 70% decrease in optimal horseshoe crab spawning habitat and a complimentary increase in unsuitable spawning habitat. If action is not taken to improve habitat, Sandy will have significantly decreased carrying capacity for horseshoe crabs and shorebirds. This report includes seven recommendations for action.

Introduction

In a brief report, done shortly after the passage of Hurricane Sandy, our team evaluated damage to Delaware Bay beaches in NJ that are important to shorebirds and horseshoe crabs (Niles et al 2012). We found extensive alteration of the bayshore that mainly decreased the suitability of these beaches for horseshoe crab breeding and, ultimately, the shorebird stopover in May. In this evaluation, which was limited to beaches accessible by vehicle, we found most beaches either lost sand altogether or the sand was washed into the supratidal area and out of reach for horseshoe crab egg laying. We found the greatest impact in the area from Reeds Beach to Villas, particularly in the Reeds to Pierces Point area of the bayshore. This area is one of the most important shorebird stopover habitats on the bay because of the large percentage of birds using the area and their relatively fast weight gains made possible by abundant horseshoe crab eggs.

In a meeting and field tour of important areas by key groups, organized by Natural Lands Trust of NJ, our team of biologists and geologists was asked to conduct a baywide assessment of the impact of Hurricane Sandy to develop a broader context on which we could evaluate the relative impact of the Cape shore losses. In this second report, we describe our baywide aerial reconnaissance of the bayshore and the comparison of our assessment of horseshoe crab habitat suitability with that done in 2006 by Lathrop et al. using 2002 imagery.

Method

Our team conducted an aerial survey of the Delaware Bay coastline on December 6, 2012, starting at 7:30 a.m. and finishing at 9:30 a.m. Low tide at the bays mid point occurred at about 8:08 a.m. (Bidwell Creek entrance, NJ). We began our flight at Cape May Point, continued north along the NJ bayshore to the mouth of the Cohansey River and crossed over to Woodland Beach Delaware, and traveled south along the

Delaware bayshore finishing at Cape Henlopen, DE. While one team member recorded the entire flight on an HD Camcorder, two others collected GPS waypoints and evaluated and recorded beach condition; flight speed was approximately 100 mph. Afterward, we replayed the video and evaluated horseshoe crab breeding habitat suitability using criteria developed by Lathrop et al. 2006, which were based on similar criteria developed by Botton et al. 1988. Habitat was classified into five categories:

- 1) Optimal: undisturbed sand beach;
- 2) Suitable: sand beach with only small areas of peat and/or backed by development
- 3) Less Suitable: habitat with exposed peat in the lower and middle intertidal zone and sand present in the upper intertidal; (Botton et al. 1988 Avoided AB category)
- 4) Avoided habitat: exposed peat or active salt marsh fringing the shoreline; no sand present (Botton et al. 1988 Avoided C category)
- 5) Disturbed due to beach fill, riprap or bulkheading (Botton et al. 1988 Avoided D category)

At least three scientists scored the beach from the video and the consensus was used to reclassify the beaches for spawning suitability (i.e., post Superstorm Sandy).

Results and Discussion

This report only evaluated the difference in spawning habitat suitability pre- and post-Hurricane Sandy for NJ. Changes in DE beaches will be done with input from DE biologists. This review is limited by the use of Lathrop et al. 2006 report, as habitat on the bayshore may have declined to some extent since then but prior to Superstorm Sandy. Nevertheless, we found a substantial loss of habitat suitability since 2002, mostly, we judged, as an impact of Sandy. Overall we found a significant loss of habitat including a estimated 70% decrease in optimal habitat and greater than 20% decrease in suitable and less suitable categories. There were complimentary increases in Avoided and Disturbed Habitats. Habitat suitability declines were primarily related to loss of sand from the upper intertidal areas. While it is difficult to assess specifically where sand was moved, extensive evidence of overwash was noted whereby sand was transported from the intertidal areas into the marshes leaving the intertidal area devoid of sand. Some sand was moved offshore during the extensive beach reprofiling that occurred and some sand moved northward along the shoreface. In many areas, storm reprofiling of the beach has resulted in a net lowering of the beach elevation so that at high tide, water now covers all sand to the vegetation line and/or exposed peat so there is no sand in which horseshoe crabs can lay eggs successfully.

The hardest hit areas were the most important for horseshoe crabs and shorebirds. The suitability of the Reed's Beach to Pierce's Point section of bayshore was substantially reduced as was the area south of Pierce's Pt. south to Villas. This Cape shore area is the heart of NJ shorebird stopover, especially for red knots, ruddy turnstones and sanderlings. Substantial damage was done to the upper bay particularly around Fortescue and the areas north of Fortescue including and northwest of Gandy's beach. Although larger portions of this northern bayshore are

less suitable for crab spawning, because it is mainly sodbank and mudflats, this area is critical to semipalmated sandpipers, dunlin, short billed dowitchers and other shorebirds that use peat and mudflat habitat for feeding. However, this northern bayshore area has numerous river and creek mouths with sandy shoals that provide spawning habitats sheltered from rough surf. These creek-mouth beaches and shoals are critical spawning and shorebird use sites especially in periods of strong west winds and bad weather that commonly occur on Delaware Bay.

Our aerial review substantiates our ground assessment and places it into a disturbing context. If nothing is done between now and May to recover habitat on Delaware Bay, shorebirds and horseshoe crabs will find a very significant loss of habitat area and suitability. This will exacerbate the existing barriers to recovery mostly as a result of the lack of a recovering horseshoe crab population (Hallermen and Hata 2012).

Recommendations

We recommend the following to help overcome the substantial loss of shorebird and horseshoe crab spawning habitat/suitability:

1. Expedite the implementation of the US Army Corp of Engineers (USACOE), NJ DEP and Middle Township plan to restore the beaches from Reeds Beach to Pierces Point (USACOE Dec. 2012). The agencies have also developed a project to restore beaches in the Villas area which we also consider important but a second priority to the Reeds-Pierces plan.
2. Extend the restoration of Thompsons Beach, in progress by the NJDEP and Maurice River Township, to Moore's Beach. This has already been proposed by NJDEP with funding surpluses from the Thompson's Beach restoration. We recommend that all rubble and pilings be removed, as they impede horseshoe crab movement, and to add as much sand as the budget allows to both Thompson's and Moore's. Significant sand resources are available because of extensive sand mining in the region.
3. Initiate a project to remove beach rubble and pilings on other sites through a combination of funded contractors and volunteers. This will help immediately improve habitat suitability for horseshoe crabs that will complement beach replenishment projects that may or may not occur before May 2013.
4. Complete the reconnaissance for Delaware. In a cursory review of our flight recording, it appears there was extensive damage to crab breeding habitat in key areas like Mispillion Harbor, DE. This needs to be assessed quickly as the loss of Mispillion Harbor would have the same impact as the loss of the Reed's Beach to Pierce's Point section.
5. Begin immediately experimenting with man-made oyster reefs in waters adjacent to key beaches. This provides protection from wind-driven waves creating sheltered water and superior conditions for crab breeding. An existing project proposal at Moore's Beach should be expedited and a new project farther south along the Cook's Beach area should be developed.
6. A more thorough assessment of horseshoe crab breeding conditions needs to take place on the bay to better understand long-term conditions that facilitate crab population recovery. This work should be funded and conducted with more collaborators and better information.

7. Begin the process of replenishing the beaches of Fortescue and Raybin's beach. These beaches are currently important but have great potential for significantly increasing the overall carrying capacity for horseshoe crabs and shorebirds if replenished. The human need for replenishing Fortescue's beaches is completely compatible with that of shorebirds and horseshoe crabs.

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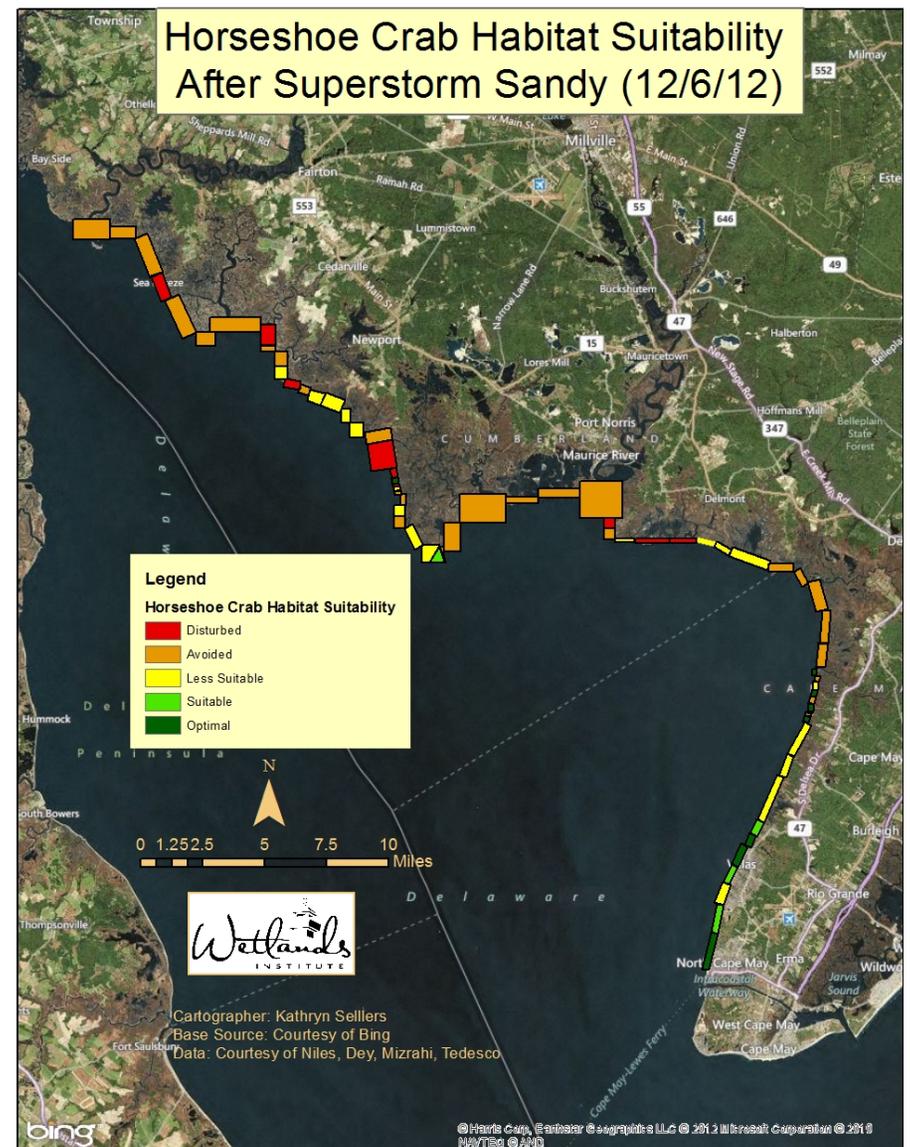
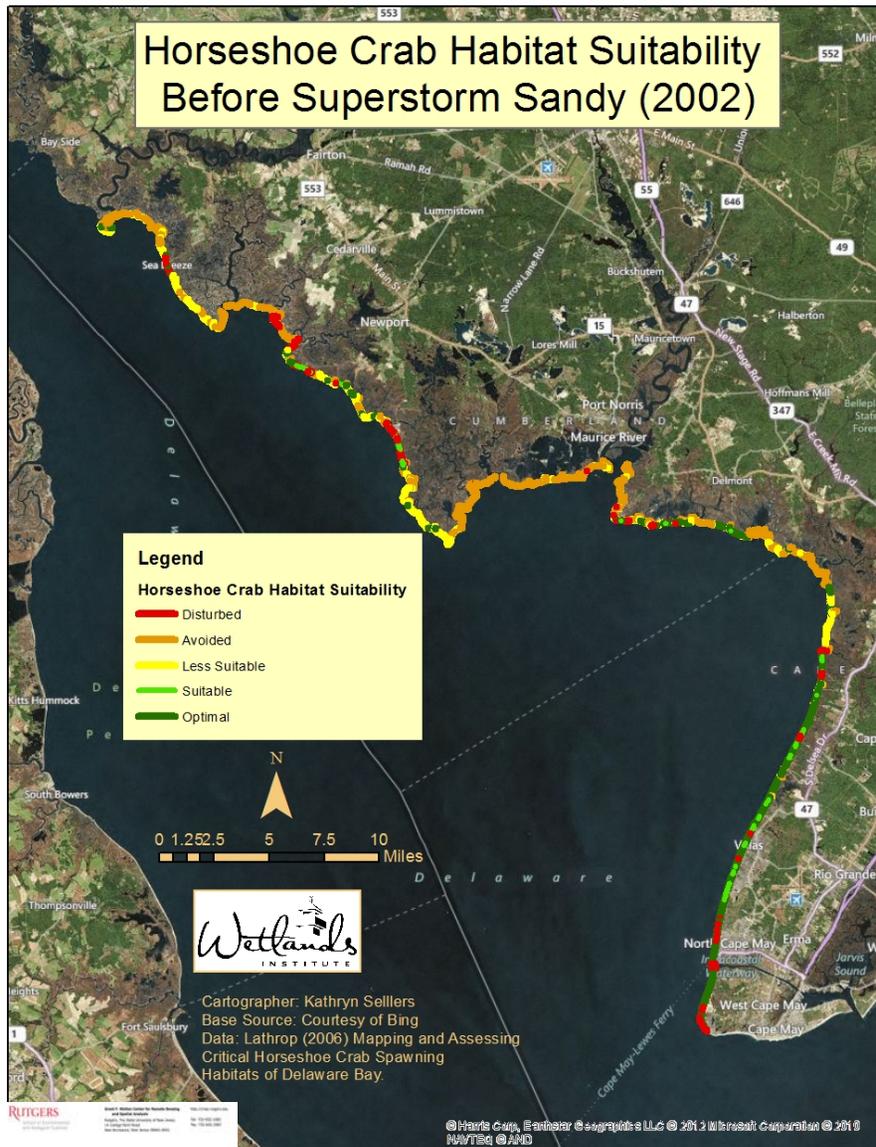


Figure 1. Two maps of horseshoe crab suitability, the first developed by Lathrop et al 2006 , the second by our team using Lathrop et al criteria. The greatest areas of loss occurring along the Cape May peninsula and the area northwest of and including Fortescue. The significant loss of both optimal, suitable, and less suitable habitat for horseshoe crab breeding may have a significant impact on 2013 Shorebird stopover exacerbating the continuing problem of the lack of recovery in horseshoe crab population (Hallermen and Hatt 2012)



Figure 2 A beach near Moore's Beach on Delaware Bay showing the movement of sand into the marsh transforming the intertidal area to eroded sod. Horseshoe crabs cannot successfully breed in sod.



Figure 3 Large amounts of rubble and old pilings were exposed at South Reeds beach with the erosion of the beach. This debris will prevent crabs from successfully breeding on this otherwise suitable sandy beach.